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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/639,495	08/14/2000	Mehrdad Nikoonahad	TNCR.181US	9910

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EXAMINER

FULLER, RODNEY EVAN

ART UNIT PAPER NUMBER

2851

DATE MAILED: 03/18/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary

Application No.

09/639,495

Applicant(s)

NIKOONAHAD ET AL.

Examiner

Rodney E Fuller

Art Unit

2851

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-43 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-43 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 August 2000 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4 & 5.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Objections

1. Claim 23 recites the limitation "the prism" in line 2. There is insufficient antecedent basis for this limitation in the claim.

Drawings

2. New corrected drawings are required in this application because the drawings are informal. Applicant is advised to employ the services of a competent patent draftsman outside the Office, as the U.S. Patent and Trademark Office no longer prepares new drawings. The corrected drawings are required in reply to the Office action to avoid abandonment of the application. The requirement for corrected drawings will not be held in abeyance.
3. The drawings are objected to because Figure 14 shows only two "empty boxes" without any labels or structure. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1-43 are rejected under 35 U.S.C. 102(b) as being anticipated by Komatsu, et al. (US 5,171,999).

Regarding claims 1, 19, 39, 41-43, Komatsu discloses “a source (Fig. 1, ref.# 10) providing a radiation beam that is substantially coherent to illuminate a portion of each of the two structures (Fig. 1, ref.# WM), each of said portions having a dimension along the first line larger than the period of the corresponding structure; two or more detectors (Fig. 1, ref.# 31, 34), each detector detecting a diffracted radiation signal from the illuminated portion of each structure to provide an output signal; and a processor (Fig. 1, ref.# 50, 51) determining from said output signals any misalignment between structures.”

Regarding claims 2 and 20, Komatsu discloses “a first device (Fig. 1, ref.# 13) dividing a substantially coherent beam of radiation into a first and second beam that are substantially coherent, wherein radiation from said first beam illuminates one of the structures and radiation from the second beam illuminates the other of the structures.”

Regarding claims 3, 12, 21 and 25, Komatsu discloses “wherein the first device is a birefringent or acoustooptic element.” (Fig. 1, ref.# 13 and column 8, line 1).

Regarding claims 4 and 30, Komatsu discloses “modulating the first beam at a first frequency before radiation from the first beam is employed to illuminate said one of the structures.” (Fig. 1, ref.# 15a)

Regarding claims 5 and 31, Komatsu discloses “modulating the second beam at a second frequency before the radiation from the second beam is employed to illuminate said other one of the structures.” (Fig. 1, ref.# 15b)

Regarding claims 6 and 32, Komatsu discloses “wherein said detecting detects at a frequency that is proportional to a difference between the first and second frequencies, or between multiples thereof.” (Fig. 1, ref.# 31, 34, and 50)

Regarding claims 7 and 33, Komatsu discloses “wherein said modulating beam includes splitting said coherent beam into a third and fourth beam, modulating the third and fourth beams by a different frequency and combining the modulated third and fourth beam into a combined beam.” (Fig. 1, ref.# 13, 18, 20)

Regarding claims 8 and 34, Komatsu discloses “wherein said splitting into the third and fourth beams employs a polarizing beam splitter.” (Fig. 1, ref.# 13 and column 8, line 1)

Regarding claims 9 and 35, Komatsu discloses “wherein said combined beam is substantially coherent and is divided into said first and second beams by the dividing.” (Fig. 1, ref.# 18, 20)

Regarding claims 10 and 36, Komatsu discloses “wherein said illuminating uses radiation that contains a component at a second frequency, and said detecting detects at a frequency that is proportional to a difference between and/or sum of the first and second frequencies, or a difference between and/or sum of multiples thereof.” (column 8, line 26)

Regarding claims 11 and 24, Komatsu discloses “combining the diffracted radiation signals from the illuminated portions of the two structures; and supplying the combined diffracted radiation signals to one or more detectors.” (Fig. 1, ref.# 31, 34)

Regarding claims 13, 22 and 26, Komatsu discloses “causing relative motion between the element and the structures (column 7, line 45), and wherein said determining

includes calculating a phase difference between the diffraction radiation signals that are detected from the two structures when said relative motion is caused.” (Fig. 1, ref. # 50)

Regarding claims 14 and 27, Komatsu discloses “wherein combining combines a first order diffraction signal from each of the two structures.” (column 16, lines 34-38)

Regarding claims 15 and 28, Komatsu discloses “wherein said combining combines a positive first order diffraction signal from one of the two structures with a positive first order diffraction signal from the other of the structure and combines a negative first order diffraction signal from one of the two structures with a negative first order diffraction signal from the other of the structure.” (column 16, line 34-38)

Regarding claims 16 and 29, Komatsu discloses “causing a change in the relative phase between radiation illuminating one of the two structures and radiation illuminating the other of the two structures, or between the diffracted radiation signals from one of the two structures and the diffracted radiation signals from the other of the two structures.” (column 4, lines 59-66)

Regarding claims 17 and 37, Komatsu discloses “wherein said illuminating employs a single beam (Fig. 1, ref.# 10) to illuminate the two portions of the two structures (Fig. 1, ref.# WM), with a part of the beam illuminating the portion of one structure, and another part of the beam illuminating the portion of the other structure.”

Regarding claims 18 and 38, Komatsu discloses “wherein said two periodic structures are also periodic substantially along a second line transverse to the first line, and wherein said determining determines misalignments between the structures along the first and second lines.” (Fig. 1, ref.# WM)

Regarding claim 23, Komatsu discloses “wherein the first device (Fig. 1, ref.# 13) has an optical axis at an angle of about 45 deg to one side of the prism.”

Regarding claim 39, Komatsu discloses “adjusting a lithographical instrument in response to the misalignment.” (column 1, lines 15-16)

Regarding claim 40, Komatsu discloses “wherein said adjusting adjusts a lithographical stepper.” (column 7, line 45)

6. Claims 1-6, 10-32 and 36-43 are rejected under 35 U.S.C. 102(b) as being anticipated by Nose, et al. (US 5,751,426)

Regarding claims 1, 19, 39, 41-43, Nose discloses “a source (Fig. 4, ref.# 3) providing a radiation beam that is substantially coherent to illuminate a portion of each of the two structures (Fig. 4, ref.# 2a, 2b), each of said portions having a dimension along the first line larger than the period of the corresponding structure; two or more detectors (Fig. 4, ref.# 12, 14), each detector detecting a diffracted radiation signal from the illuminated portion of each structure to provide an output signal; and a processor (Fig. 4, ref.# 13) determining from said output signals any misalignment between structures.”

Regarding claims 2 and 20, Nose discloses “a first device (Fig. 4, ref.# 7) dividing a substantially coherent beam of radiation into a first and second beam that are substantially coherent, wherein radiation from said first beam illuminates one of the structures and radiation from the second beam illuminates the other of the structures.”

Regarding claims 3, 12, 21 and 25, Nose discloses “wherein the first device is a birefringent or acoustooptic element.” (Fig. 4, ref.# 7, column 6, line 8)

Regarding claims 4 and 30, Nose discloses “modulating the first beam at a first frequency before radiation from the first beam is employed to illuminate said one of the structures.” (Fig. 4, ref.# 4)

Regarding claims 5 and 31, Nose discloses “modulating the second beam at a second frequency before the radiation from the second beam is employed to illuminate said other one of the structures.” (column 4, line 18)

Regarding claims 6 and 32, Nose discloses “wherein said detecting detects at a frequency that is proportional to a difference between the first and second frequencies, or between multiples thereof.” (Fig. 4, ref.# 12, 13, 14)

Regarding claims 10 and 36, Nose discloses “wherein said illuminating uses radiation that contains a component at a second frequency, and said detecting detects at a frequency that is proportional to a difference between and/or sum of the first and second frequencies, or a difference between and/or sum of multiples thereof.” (column 4, line 18 and Fig. 4, ref.# 13)

Regarding claims 11 and 24, Nose discloses “combining the diffracted radiation signals from the illuminated portions of the two structures; and supplying the combined diffracted radiation signals to one or more detectors.” (Fig. 4, ref.# 12, 14)

Regarding claims 13, 22 and 26, Nose discloses “causing relative motion between the element and the structures, and wherein said determining includes calculating a phase difference between the diffraction radiation signals that are detected from the two structures when said relative motion is caused.” (column 1, lines 12-21)

Regarding claims 14 and 27, Nose discloses “wherein combining combines a first order diffraction signal from each of the two structures.” (column 4, lines 19-28)

Regarding claims 15 and 28, Nose discloses “wherein said combining combines a positive first order diffraction signal from one of the two structures with a positive first order diffraction signal from the other of the structure and combines a negative first order diffraction signal from one of the two structures with a negative first order diffraction signal from the other of the structure.” (column 4, lines 19-28)

Regarding claims 16 and 29, Nose discloses “causing a change in the relative phase between radiation illuminating one of the two structures and radiation illuminating the other of the two structures, or between the diffracted radiation signals from one of the two structures and the diffracted radiation signals from the other of the two structures.” (column 1, lines 12-21)

Regarding claims 17 and 37, Nose discloses “wherein said illuminating employs a single beam to illuminate the two portions of the two structures, with a part of the beam illuminating the portion of one structure, and another part of the beam illuminating the portion of the other structure.” (Fig. 14, ray path)

Regarding claims 18 and 38, Nose discloses “wherein said two periodic structures are also periodic substantially along a second line transverse to the first line, and wherein said determining determines misalignments between the structures along the first and second lines.” (Fig. 2, ref.# 2a, 2b)

Regarding claim 23, Nose discloses “wherein the first device has an optical axis at an angle of about 45 deg to one side of the prism.” (Fig. 4, ref.# 7)

Regarding claim 39, Nose discloses “adjusting a lithographical instrument in response to the misalignment.” (column 1, lines 20-21)

Regarding claim 40, Nose discloses “wherein said adjusting adjusts a lithographical stepper.” (column 1, lines 16-21)

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

Nose, et al. (US 5,333,050), Magome, et al. (US 4,710,026), Weigl (US 6,294,296), and Ota, et al. (US 5,689,339) each discloses “a source providing a radiation beam that is substantially coherent to illuminate a portion of each of the two structures, each of said portions having a dimension along the first line larger than the period of the corresponding structure; two or more detectors, each detector detecting a diffracted radiation signal from the illuminated portion of each structure to provide an output signal; and a processor determining from said output signals any misalignment between structures.”

Art Unit: 2851

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rodney Fuller whose telephone number is (703) 306-5641. The examiner can normally be reached on Monday through Friday from 8:00 am to 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Russ Adams, can be reached on (703) 308-2847.

Rodney Fuller
Primary Examiner

A handwritten signature in black ink, appearing to read 'R. Fuller', is written over the printed name of the examiner.

March 11, 2003